CLAIMS:

1. A method of electronically commutating a permanent magnet rotor brushless dc motor having three phase stator windings for producing rotating magnetic flux comprising the steps of:

commutating current to successive combinations of two of said windings to cause flux rotation in a desired direction,

sensing in only one of said windings the periodic back EMF induced by rotation of the permanent magnet rotor,

said sensing being enabled in the two out of six 60° intervals of flux rotation when the sensed winding has no current commutated to it,

digitising said sensed back EMF signal in said one winding by detecting the zero-crossings of said signal,

determining a half period time of said signal by obtaining a measure of the time between the pulse edges in the digitised signal which are due to zero crossings,

from said half period time deriving the 60° flux rotation time (commutation period) and causing each said commutation to occur at times which are substantially defined by each logic transition in said digitised signal due to zero crossings and at the derived 60° and 120° angles of flux rotation which follow said zero crossings.

2. A method according to claim 1 wherein said derived commutation times are determined by calculating one third and two thirds respectively of said half period time.

3. A method according to either of claims 1 or 2 wherein said half period is a moving average of a succession measured times between zero-crossings.

4. A method according to any one of the preceding claims wherein the 120° flux angle commutations are advanced by a predetermined time.

5. An electronically commutated brushless dc motor comprising:

a stator having a plurality of windings adapted to be selectively commutated to produce a rotating magnetic flux,

a rotor rotated by said rotating magnetic flux;

a direct current power supply having positive and negative output nodes;

commutation devices connected to respective windings which selectively switch a respective winding to said output nodes in response to a pattern of control signals which leave at least one of said windings unpowered at any one time while the other said windings are powered so as to cause stator flux to rotate in a desired direction;

digitising means coupled to one only of said windings for digitising the back EMF induced in that winding by detecting the zero crossings of said back EMF signal; and

a microcomputer operating under stored program control, said microcomputer having an input port for said digitized back EMF signal and output ports for providing said commutation switch control signals, said microcomputer determining from said digitised back EMF signal a measure of the half period thereof by measuring the time between the pulse edges in the digitised signal which are due to zero-crossings, said microcomputer effectively dividing said determined half period by a number equal to the number of stator windings to produce a commutation period, said microcomputer producing commutation control signals at said output ports to cause the stator flux to rotate whereby switchings of said commutation devices are timed to occur at each zero-crossing of said back EMF signal and at intervals therebetween substantially equal to said commutation period.

6. A motor according to claim 5 wherein said microcomputer is programmed to switch said commutation devices at intervals between said zero-crossings of said back EMF signal which are calculated as one third and two thirds respectively of said measure of half period time.

7. A motor according to either of claims 5 or 6 wherein said microcomputer is programmed to provide said measure of half period time by calculating a moving average of successive measured times between pulse edges in said digitised signal which are due to zero-crossings.

8. A motor according to either of claims 6 or 7 (when dependent on claim 6) wherein said microcomputer is programmed to subtract a predetermined time from said calculated two

thirds of said measure of half period time to produce an advanced time to switch said commutation devices at said advanced time.

9. A motor according to claim 5 including:

freewheel diodes connected in parallel with each commutation device, a pulse width modulator which modulates said commutation switch control signals with a controllable duty cycle to vary the effective voltage applied from said direct current power supply to said stator windings, and wherein said microcomputer is programmed to:

(1) monitor the trailing edge of a pulse in the digitised back EMF due to current flowing through a free wheel diode when said sensed winding has been disconnected from said direct current supply,

(2) calculate the time interval between the trailing edge of said pulse and the next detected zero-crossing the in back EMF signal, and

(3) if said calculated time interval is less than a pre-stored value, altering the duty cycle of said pulse width modulation to reduce the voltage applied to said stator windings.

10. A washing appliance pump including:

a housing having a liquid inlet and a liquid outlet,

an impeller located in said housing, and

an electronically commutated motor which rotates said impeller, said electronically commutated motor comprising:

a stator having a plurality of windings adapted to be selectively commutated,

a rotor driveably coupled to said impeller;

a direct current power supply having positive and negative output nodes;

commutation devices connected to respective windings which selectively switch a respective winding to said output nodes in response to a pattern of control signals which leave at least one of said windings unpowered at any one time while the other said windings are powered so as to cause stator flux to rotate in a desired direction;

digitising means coupled to one only of said windings for digitising the back EMF included in that winding by detecting the zero crossings of said back EMF signal; and

a microcomputer operating under stored program control, said microcomputer having an input port for said digitized back EMF signal and output ports for providing said commutation switch control signals, said microcomputer determining from said digitised back EMF signal a measure of the half period thereof by measuring the time between the pulse edges in the digitised signal which are due to zero-crossings, said microcomputer effectively dividing said determined half period by a number equal to the number of stator windings to produce a commutation period, said microcomputer producing commutation control signals at said output ports to cause the stator flux to rotate whereby switchings of said commutation devices are timed to occur at each zero-crossing of said back EMF signal and at intervals therebetween substantially equal to said commutation period.

11. A washing appliance pump according to claim 10 wherein said microcomputer is programmed to switch said commutation devices at intervals between said zero-crossings of said back EMF signal which are calculated as one third and two thirds respectively of said measure of half period time.

12. A washing appliance pump according to either of claims 10 or 11 wherein said microcomputer is programmed to provide said measure of half period time by calculating a moving average of successive measured times between pulse edges in said digitised signal which are due to zero-crossings.

13. A washing appliance pump according to either to claims 11 or 12 (when dependent on claim 11) wherein said microcomputer is programmed to subtract a predetermined time from said calculated two thirds of said measure of half period time to produce an advanced time to switch said commutation devices at said advanced time.

14. A washing appliance pump according to claim 10 including:

freewheel diodes connected in parallel with each commutation device, a pulse width modulator which modulates said commutation switch control signals with a controllable duty

cycle to vary the effective voltage applied from said direct current power supply to said stator windings, and wherein said microcomputer is programmed to:

(1) monitor the trailing edge of a pulse in the digitised back EMF due to current flowing through a free wheel diode when said sensed winding has been disconnected from said direct current supply,

(2) calculate the time interval between the trailing edge of said pulse and the next detected zero-crossing the in back EMF signal, and

(3) if said calculated time interval is less than a pre-stored value, altering the duty cycle of said pulse width modulation to reduce the voltage applied to said stator windings.

15. An electronically commutated brushless dc motor substantially as hereinbefore described with reference to Figures 3 and 5 of the accompanying drawings.

16. A washing appliance pump substantially as hereinbefore described with reference to Figures 3, 5 and 6 of the accompanying drawings.